The role of private medical insurance in socioeconomic inequalities in cancer screening uptake in the Republic of Ireland

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Abstract

Screening is seen by many as a key element in cancer control strategies. Differences in uptake of screening related to socioeconomic status exist and may contribute to differences in morbidity and mortality across socioeconomic groups. While a number of factors are likely to underlie differential uptake, differential access to subsequent diagnostic tests and/or treatment may have a pivotal role. This study examines differences in the uptake of cancer screening in Ireland related to socioeconomic status. Data were extracted from SLÁN 2007 concerning uptake of breast, cervical, colorectal and prostate cancer screening in the preceding 12 months. Concentration indices were calculated by socioeconomic grouping and decomposed to identify the contribution to differential uptake of a range of variables. Particular emphasis was placed upon the impact of private health insurance, evidenced in other work to impact on access to care within the mixed public-private Irish health system. This study found that significant differences related to socioeconomic status exist with respect to uptake of cancer screening and that the main determinant of difference for breast, colorectal and prostate cancer screening was possession of private insurance. This may have profound implications for the design of cancer control strategies in countries where private insurance has a significant role, even where screening services are publicly funded and population-based.

1. Introduction

The mixed public-private health care system that operates in the Republic of Ireland provides a complex environment within which services are delivered and accessed. Within the Irish system, those without a medical card (entitlement to which, at the time of this study, was means-tested in those under 70 and universal in those 70 and older), must pay a contribution for visiting primary care physicians and for hospital inpatient stays (approx €60 per visit/night) as well as the full costs of prescription medications (HSE, 2009). Most hospitals, including public hospitals, offer private care and at any stage, patients can transfer from public to private care. Approximately 30% of the population have a medical card and just under half have private health insurance. (Wiley, 2005)

Previous work using concentration indices (Kakwani et al, 1997) has demonstrated a pro-poor pattern of utilization (Layte and Nolan, 2004) with respect to primary care services in Ireland. This may be explained by the fact that the poorest third of the population (and those aged 70 and over) hold medical cards (Nolan 2007). By contrast pro-rich patterns of utilization have been observed with respect to specialist care services (Layte and Nolan, 2004) where waiting lists in the public system exist and 20% of public hospitals' capacity remains reserved for private patients (Wiley 2005).

Decomposition analyses of social inequalities in other contexts have shown that much of the inequality in the utilisation of specialist services may relate to the operation of mixed public-private healthcare wherein possession of insurance or private payments may afford faster access to care (Van Doorslaer et al., 2004b, Van Doorslaer et al., 2008). Possession of

insurance, however, may impact not only on the decision to access services to which differential entitlements exist but because of the integrated nature of healthcare they may also impact on the decision to access services where entitlements are supposedly the same. For example, with respect to cancer screening, in as much as the value of a screen is conditional on subsequent access to diagnostic and treatment services, the absence of insurance may attenuate the benefits of screening for those without insurance even where the screen itself is publicly funded.

Research from other healthcare systems, in which access to services relate to possession of private health insurance, has identified insurance as one of the main determinants of cancer screening utilisation (Swan et al., 2010, Weber et al., 2008). In Ireland only for breast cancer is a publicly funded population-based programme fully operational in line with EU Council recommendations (EU Council 2003). While a population-based cervical cancer screening programme was established in late 2008, this has not yet been fully rolled out. In this context it is perhaps unsurprising that there has been a paucity of research regarding cancer screening uptake in Ireland or variations in uptake across socio-demographic groups. Previous research has found significant socioeconomic variations in the uptake of breast and cervical cancer screening, variations that were not present in other jurisdictions (Walsh et al., 2010, Walsh et al., 2011a).

In this study we examine the extent of socioeconomic inequality across a number of screening services available in the Republic of Ireland using concentration indices. We decompose the indices to examine the role of insurance in this inequality. This, to the best of our knowledge, is the first time a decomposition analysis of a particular specialist service,

cancer screening, has been undertaken in a European context. While the focus of the study is on the Irish experience in respect of cancer screening, the insights with respect to use of specialist services are pertinent to healthcare services and systems generally where entitlements vary.

2. Methods

Data Analysis

Data were extracted from SLÁN 2007 - a large representative, cross-sectional survey of health and wellbeing conducted using face-to-face interviews with 10,364 adults. Individual-based data were collected on a range of issues, including for the first time in Ireland, data on uptake of breast, prostate, colorectal and cervical cancer screening in the preceding 12 months. Details of the dataset are also discussed extensively elsewhere (Walsh et al., 2010, Morgan et al., 2008). Included in the dataset are a range of socioeconomic variables that allow for a detailed socio-demographic characterization of the respondent. Data on 1203 women aged 50-64, (the age range targeted by the national breast cancer screening programme) and 3937 women aged 25-64 (the age range targeted by the national cervical programme) were extracted. Data on 3066 individuals aged 50-74 and 1404 men aged 50-74 were extracted with respect to colorectal and prostate cancer screening respectively. No population-based screening programmes operate in the Republic of Ireland for the latter two cancers but the age ranges specified reflect those used in other programmes or recommended by the EU Council (Schroder et al., 2009, Advisory Committee on Cancer Prevention, 2000). Net equivalised household income, household socioeconomic status (based on occupation), geographic location, age, marital status, insurance coverage and self reported health were

used in the decomposition analyses based upon their anticipated impact on screening utilisation.

Concentration indices

Equivalised net household income was used as the ranking variable in the construction of the concentration indices[1]. Income was recorded as 25 categories in the survey, with class midpoint used as the income level for each group. Chen et al. (2009) have shown that grouped income data may lead to an underestimation of the concentration index. But the extensive number of income categories used here together with the subsequent use of an equivalence scale allows for within group variation thus mitigating any underestimation in the resultant concentration indices. Following Kakwani et al. (1997) and Van Doorslaer et al. (1997) the concentration index is presented as equation 1.[2]

$$CI = \frac{2}{N\mu}\sum_{i=1}^{n} y_i R_i - 1 \quad (1)$$

As in our analyses the dependent variable was a binary response (whether individuals had a screen in the previous 12 months or not), normalised concentration indices of screening utilisation and fractional rank of income were calculated using the binary variable method in Wagstaff (2005).[3]

[1] Total household income is divided by an equivalence scale which takes the value 1 for the first adult in the household, 0.66 for any subsequent adults and 0.33 for each child. This scale has been used in previous research by Layte and Nolan (2004).

[2] In equation 1 y_i is the health variable (whether an individual had a cancer screen in the preceding 12 months) which has been distributed according to socioeconomic status from lowest to highest group. μ is the mean of our health variable. R_i is the fractional rank of the ith individual within the socioeconomic distribution. Thus CI measures relative inequality across the socioeconomic distribution with a positive result reflecting a pro-rich inequality.

[3] Normalisation of the concentration indices using methods put forth by Erreygers (2009) were also undertaken, with results similar to those produced using Wagstaff (2005) methods.

$$CI_n = \frac{CI}{(1-\mu)} \quad (2)$$

Decomposition analyses of the overall inequality thus allow us to establish the importance of particular components of the inequality in screening uptake by partitioning total inequality into the specific inequalities observed by each individual regressor. Hence the decomposition allows for the unpacking of the variables that contribute to the level of inequality and permits a clearer identification of possible policy instruments (Van Doorslaer et al., 2004a). As the likelihood of uptake is intrinsically a non-linear relationship our analyses are based upon a logistic model. Within our statistical analyses, the logistic regression was shown to have the most explanatory power of the regression approaches. In order for a decomposition to take place a linear approximation is thus needed. An average partial effects approach, following the logistic regression is used for the decomposition whereby β_k^n, the sample mean within each group, is the average partial effects for each determinant x. This approach allows for the decomposition of the main determinants underpinning any inequalities.

$$y_i = \sum_k \beta_k^n x_i^k + \varepsilon_i \quad (3)$$

$$\widehat{CI}_n = \left(\frac{\beta_r \bar{x}_r}{\mu}\right)\widehat{CI}_r \sum_k \left(\beta_k \frac{\bar{x}_k}{\mu}\right)\widehat{CI}_k + \frac{GC_\varepsilon}{\mu} \quad (4)$$

In equation 4, the first expression represents the contribution of equivalised income, the second expression represents the other socioeconomic variables perceived to influence screening utilisation while the final expression represents the residual term.

3. Results

Table I provides descriptive statistics that highlight variations in screening utilisation across socioeconomic groups. Those with higher income, higher socioeconomic status and higher educational attainment have greater uptake for all types of screening. The largest difference is observed between those with and without medical insurance. Uptake of cervical (18%) and colorectal (12%) cancer screening is seen to be lower than that for the other types of cancer. The high uptake of prostate (29%) cancer screening may be noteworthy given concerns regarding the value of untargeted and repeat screening for this cancer.

The normalised concentration indices in Table II demonstrate significant socioeconomic inequality in cancer screening uptake in the Republic of Ireland. While the largest inequality is observed for prostate cancer screening (0.1444), it is notable that inequality observed for breast cancer screening (0.1229), which was part of a publicly funded population-based programme at this time, is large. Concentration indices for breast (0.1229), cervical (0.1014), colorectal (0.0695) and prostate (0.1444) cancer were all found to be statistically significant at the 95% level. It has been stated that a concentration index of 0.1 corresponds to a relative rate of approximately 2 and has significant implications for health policy (Webb et al., 2005). These results show that for three of the cancers, the socioeconomic inequalities observed may lead to significant public health issues.

The decomposition of the concentration indices are shown in Table III. While differences across socioeconomic group is the largest determinant of inequality observed for cervical cancer, insurance is the largest determinant for breast, colorectal and prostate cancer

screening, contributing 22%, 60% and 39% of the inequality respectively. In the interests of brevity, differences across age, geographic location and other variables are not discussed in this study.

4. Conclusion

The diagnosis and treatment of many conditions involves primary, secondary and tertiary level services working together. Even when access to parts of a system are, in the interests of equity, publicly funded and/or provided, if the effectiveness of any one part is contingent upon access to other parts to which insurance affords differential access, publically funded services may fail to eradicate inequalities at all levels. More generally if the speed with which a patient moves along any part of a care pathway can be expedited by private insurance, differences in patterns of utilization are likely to manifest themselves throughout the care pathway. These differences may ultimately initiate differential health outcomes and may be more evident for some cancers than others, for example, in cervical cancer where incidence is higher among lower socioeconomic groups (Kahn et al., 2007).

This study demonstrates inequality in the uptake of cancer screening in the Republic of Ireland and the role of private medical insurance in this. The results extend the findings of previous studies where the largest pro-rich inequalities in specialist care utilisation were observed in health systems, including Ireland, whereby the provision of secondary services was at least partially contingent upon private insurance and/or out-of pocket payments (Layte and Nolan 2004, Van Doorslaer et al., 2004a, Jones et al., 2006). With respect to breast cancer, that a population-based screening programme had been established at the time

of the survey (though not fully implemented), is noteworthy given the large inequality observed here (0.1229). Whether inequalities reduce as this programme matures remains to be seen (Walsh et al., 2011b) but that establishment of a state-funded programme per-se will not eliminate inequalities in screening utilisation is evident.

This study highlights that in the case of three of the cancers considered; possession of insurance is the central determinant to inequalities in uptake. Work by Kenkel (1994) has shown that insurance coverage for curative care encourages the use of screening as the earlier detection of a cancer is only valuable in the presence of earlier treatment interventions. While access to diagnostics and treatment may be more equitable in the case of breast cancer where arrangements for this have been made as part of the population-based screening initiative, as has been shown in the Republic of Ireland the perception may still remain that having insurance has a role to play in diagnosis and treatment (Harmon and Nolan, 2001). That those who hold private insurance may attach a higher value to health or possess a greater knowledge of how to use the healthcare system is possible and could offer an alternative explanation for the results. Given the work of Harmon and Nolan (2001) and O'Malley et al (2004) it would though be perverse to argue that the differential access insurance affords does not have a role in inequalities and is not acquired because of this.

Unless and until access to subsequent diagnosis and care is as equitable as access to population-based screening programme, these results may be replicated in each of the other cancers, and may survive the introduction of publicly funded population-based screening services and be replicated in other parts of the system and be observed in other healthcare systems.

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Table I Percentage uptake of cancer screening in Ireland in preceding 12 months.

	Breast Cancer Screening %	Cervical Cancer Screening %	Colorectal Cancer Screening %	Prostate Cancer Screening %
Observations	1203	3937	3066	1404
Total %	33.92	17.98	11.53	29.47
Socioeconomic Group				
SES1	40.25	22.63	14.93	36.94
SES2	33.33	17.83	12.23	32.50
SES3	30.95	17.16	9.53	26.01
SES4	29.89	11.76	10.25	22.36
SES5	29.81	14.87	5.08	23.81
Education				
Degree or above	40.94	21.64	11.97	34.85
Lower tertiary	40.11	20.70	13.73	43.36
Upper secondary	35.93	17.76	13.98	31.88
Lower secondary	27.7	13.36	9.25	21.48
Primary	30.28	12.69	10.55	25.91
Insurance				
Yes	38.04	20.54	13.57	36.34
No	27.87	14.57	8.84	20.08
Marital Status				
Married	34.86	19.16	12.51	33.67
Not Married	31.82	15.53	9.72	21.46
Geographic location				
Dublin	41.58	17.86	12.85	30.60
Border	29.41	16.87	7.84	21.05
Mid-East	56.54	19.75	10.08	18.45
Midlands	38.81	23.46	19.25	40.00
Mid-West	18.28	21.22	10.42	25.19
South East	36.18	18.50	14.07	37.50
South West	20.00	15.08	8.60	32.02
West	21.15	14.33	12.24	28.44
Age				
25-29 years	-	16.34	-	-
30-34 years	-	18.56	-	-
35-39 years	-	18.89	-	-
40-44 years	-	17.79	-	-
45-49 years	-	21.03	-	-
50-54 years	30.64	18.49	9.07	23.08
55-59 years	34.24	16.07	11.01	28.32
60-64 years	37.64	15.03	13.94	34.34
65-69 years	-	-	12.61	35.68
70-74 years	-	-	13.04	27.03
Self reported Health				
Good	33.13	17.65	10.56	30.37
Bad	37.50	21.04	15.12	26.71
Gender				
Male	-	-	14.67	-
Female	-	-	8.99	-

Table II: Concentration Indices of cancer screening utilisation and socio-economic inequality

	Breast cancer screening	Cervical cancer screening	Colorectal cancer screening	Prostate cancer screening
Concentration index	0.1229	0.1014	0.0695	0.1444
Standard error	0.0377	0.0261	0.0352	0.0350
T value	3.26	3.88	1.99	4.12

Table III: Decomposition of concentration index of socioeconomic inequality gradient.[#*]

	Breast Cancer Screening (%)	Cervical Cancer Screening (%)	Colorectal Cancer Screening (%)	Prostate Cancer Screening (%)
CI (Actual)	0.1229	0.1014	0.0695	0.1444
CI (Predicted)	0.0831	0.0780	0.0584	0.1010
GCI(Residual)	0.0398	0.0234	0.0111	0.0434
Ln(income)	0.0189 (15.4)	0.0155 (15.3)	0.0116 (16.7)	0.0317 (21.9)
Socioeconomic Group				
SES 1	0	0	0	0
SES 2	-0.0005 (0.4)	0.0005 (0.4)	0.0003 (0.4)	0.0002 (0.1)
SES 3	0.0017 (1.3)	0.0033 (3.1)	0.0016 (2.2)	0.0037 (2.6)
SES 4	0.0108 (8.8)	0.0388 (38.3)	0.0059 (8.6)	0.0144 (10.0)
SES 5	0.0077 (6.3)	0.0057 (5.5)	0.0068 (9.7)	0.0012 (0.08)
Insurance	0.0261 (21.8)	0.0038 (3.8)	0.0417 (60.0)	0.0565 (39.1)
Education				
Degree or above	0	0	0	0
Lower tertiary	0.0014 (1.2)	0.0010 (0.9)	0.0052 (7.5)	0.0017 (1.2)
Upper secondary	-0.0011 (1.0)	0.0006 (0.5)	0.0035 (5.1)	0.0003 (0.2)
Lower secondary	0.0094 (7.7)	0.0116 (12.0)	0.0027 (3.9)	0.0049 (3.4)
Primary	0.0098 (8.0)	0.0074 (7.4)	-0.0027 (-3.4)	-0.0022 (-1.5)
Married	0.0007 (0.6)	0.0041 (4.0)	0.0048 (7.0)	0.0078 (5.4)
Geographic location				
Dublin	0	0	0	0
Border	0.0035 (2.9)	-0.0009 (-0.9)	0.0065 (9.3)	0.0059 (4.1)
Mid-East	0.0025 (2.1)	-0.0003 (-0.4)	-0.0033 (-4.7)	-0.0032 (-2.2)
Midlands	0.0002 (0)	-0.0010 (-1.0)	-0.0009 (-1.2)	0.0004 (0.3)
Mid-West	0.0029 (2.4)	-0.0008 (-0.9)	0.0003 (0.4)	-0.0002 (-0.2)
South East	0.0025 (2.0)	0.0001 (0.1)	-0.0001 (-0.1)	-0.0010 (-0.7)
South West	0.0015 (1.3)	-0.0007 (-0.6)	0.0009 (1.3)	-0.0000 (0.0)
West	-0.0016 (-1.3)	0.0002 (0.2)	-0.0001 (-0.1)	-0.0006 (-0.4)
Age Categories				
25-29 years	-	0.0004 (0.4)	-	-
30-34 years	-	0.0011 (1.1)	-	-
35-39 years	-	0.0007 (0.7)	-	-
40-44 years	-	-0.0001 (-0.1)	-	-
45-49 years	-	-0.0008 (-0.8)	-	-
50-54 years	-0.0040 (-3.2)	0.0000 (0.0)	-0.0125 (-17.9)	-0.0119 (-8.2)
55-59 years	-0.0017 (-1.4)	0.0002 (0.2)	-0.0050 (-7.1)	-0.0010 (-0.7)
60-64 years	0	0	0	0
65-69 years	-	-	0.0043 (6.1)	-0.0009 (-0.6)
70-74 years	-	-	0.0009 (1.4)	-0.0012 (-0.8)
Self reported health	-0.0078 (-6.3)	-0.0127 (-12.7)	-0.0243 (-40.0)	-0.0056 (-3.9)
Female	-	-	0.0103 (14.8)	-

Results represented as contributions with percentage contribution in brackets.
*Elasticities and concentration indices were each regressor were also produced but are not discussed in the results.